

REMARKS/ARGUMENTS

The Applicants thank the Examiner for his timely consideration of the application following the Request for Continued Examination filed on April 19, 2008. Each of the substantive rejections raised in the Office Action will be considered in detail below using the same headings as in the Office Action.

Claim Rejections - 35 USC 102

Claims 1, 2, 4, 9, 15, 16, and 19 were rejected under 35 USC 102(b) as allegedly being anticipated by United States Patent No. 4,538,073 (hereinafter "Freige").

Freige discloses a modular power supply system including power modules and DC-to-DC convertors. Multiple power modules and DC-to-DC convertors may be interconnected such as shown in Figure 4. The power modules produce a first fixed regulated DC voltage which is distributed to the system modules. The DC-to-DC convertors change the first DC voltage to a second regulated DC voltage. Figures 2 and 3 of Freige respectively show schematic diagrams of a power module and a DC-to-DC convertor. In the analysis of the rejected claims, page 3 of the Office Action makes reference to Figure 4, the application of the modular power supply system in Figure 1, and the schematic diagram in Figure 2 of Freige.

It is respectfully submitted, however, that each of the rejected claims incorporates features which have not been disclosed or suggested in Freige.

With reference first to claim 1, the final clause of the claim recites that each of the power sources is responsive to the sensed power supply voltage for supplying a regulated current or a regulated power to the power distribution network. This recitation in claim 1 actually includes

two features which distinguish the claim over Freige. The cited reference fails to disclose or suggest that each of a plurality of power sources is responsive to the same sensed power supply voltage, and also fails to disclose or suggest supplying a regulated current or a regulated power responsive to such sensed voltage.

Regarding power supply control, page 3 of the Office Action refers to the discussion of voltage regulation at Column 6, lines 50 to 60 of Freige. The referenced passage of Freige relates to Figure 2, and discloses that voltage regulation is accomplished by sensing an output voltage coupled through resistor R27 to resistor divider circuit R20/R22. Although Freige refers to a resistor divider circuit R20/R22, it appears the divider is actually formed by R27 and R22. R22 appears to provide input impedance as part of the frequency compensation network around the error amplifier of IC2.

A constant reference voltage level of 2.75 volts DC is maintained at a node formed by the resistors R20/R22. As the voltage output produced by the power module varies, deviation from the constant reference voltage is detected at reference/comparator integrated circuit IC2. This device is typically a TL431 available from Texas Instruments and many other companies. It includes an operational amplifier and a 2.495V voltage reference, and is often used as the error amplifier and voltage reference in power supplies. It was originally marketed as a shunt regulator, which is likely why a Zener-like symbol is used in Figure 2 of Freige.

An error output signal produced by the integrated circuit IC2 is coupled through resistors R19/R14 to the base of transistor switch Q4. In this way, conduction of transistor Q4 is adjusted to maintain the switching action of transistor Q8 such that a constant output voltage is provided.

The Applicants note that Figure 2 shows a single power module. Multiple power modules 10a to 10n may be coupled together as shown in Figure 4. Each power module 10a to 10n would have a structure as shown in Figure 2. Each power module would thus incorporate a respective set of output voltage sensing resistors R27, R20, R22 and a respective reference/comparator integrated circuit IC2 for providing its own voltage regulation. With

respect, the Applicants submit that such *per-power module* regulation does not disclose the claimed feature that each power source is responsive to sensed power supply voltage.

Claim 1 clearly recites that each of the power sources is responsive to “the” sensed power supply voltage. This is quite different from the voltage sensing and power module control mechanism disclosed in Freige. As noted above, each power module in Freige senses output voltage and uses its own sensed output voltage in voltage regulation. Claim 1, however, recites that each power supply is responsive to the same sensed power supply voltage. Thus, there is no anticipation of claim 1 by Freige.

The feature of supplying a regulated current or a regulated power to the power distribution network responsive to the sensed power supply voltage, as recited in claim 1, also appears to be absent from Freige. While Freige refers to current regulation at lines 34 to 49 of Column 6, what is actually disclosed is current limiting. With reference to Figure 2 of Freige, the integrated circuit U10, resistors R29, R30, and capacitors C26, C27 form a current limiting circuit. The integrated circuit U10 provides a compare function and produces an appropriate output signal which is coupled through the resistor R15 to the emitter of transistor Q4. In this way, current flow through the transistor Q4 is controlled. (See Column 6, lines 34 to 42)

From a review of Figure 2 and particularly the current limiting circuit and transistor Q4, it would be readily apparent to any person skilled in the art that the current limiting function is not responsive to a power supply voltage that is sensed in a power distribution network. The current limiting circuit does not sense the output voltage of the power module. Thus, although current flow through transistor Q4 is limited by the current limiting circuit, such limiting is not responsive to power module voltage. Supplying a regulated current or a regulated power to the power distribution network, as recited in claim 1, further distinguishes the claim over Freige.

The limited current through transistor Q4 is also not supplied to a power distribution network. Therefore, even if one were to consider the limited current through Q4 as being a regulated current, this current is not a supply current as recited in claim 1.

The Applicants also wish to note that Freige concentrates primarily on providing a regulated voltage at the output of the disclosed power module. Limiting of the current flow through transistor Q4 contributes to control of the main power supply switching transistor Q8, but does not in any way regulate output current or power. Freige repeatedly refers to regulation and control of output voltage levels only. It appears as though the notions of output current regulation and output power regulation are entirely absent from Freige.

Regarding claim 2, this claim recites a plurality of voltage sensors for sensing power supply voltages at a plurality of points in the power distribution network. Thus, according to claim 2, each power supply is responsive to the same set of voltages at a plurality of points in a power distribution network. As noted above, each power module in a multiple-module system in Freige would include an output voltage sensing arrangement and perform voltage regulation only in response to its own sensed voltage.

Claim 2 is thus also not anticipated by Freige.

Freige does not disclose regulated current sources, and therefore claim 4 is not anticipated. Since claim 4 depends from claim 1, it also distinguishes over Freige for the same reasons as claim 1.

Independent claim 9 recites regulating currents supplied by a plurality of power sources to a power distribution network in dependence upon sensed voltage of supplied power at at least one point in a power distribution network. Current regulation for a plurality of power sources based on the same sensed voltage appears to be absent from Freige, as discussed above.

Independent claim 15 similarly recites at least one power supply voltage sensor for sensing a power supply voltage at a respective point in a power distribution network for regulating the power supplied to the power distribution network from a plurality of power sources. Claim 15 thus distinguishes over Freige for similar reasons as claims 1 and 9.

Claim 16, similar to claim 4, recites regulated current sources, and this distinguishes the claim over Freige. The claim also depends from claim 15 and includes the distinguishing features from claim 15 as well.

Claim 19 depends from claim 15 and also distinguishes over Freige. It is noted that claim 19 further recites the feature of a plurality of sensors for sensing our supply voltage in the power distribution network, similar to claim 2, and additionally distinguishes over Freige for this reason.

In light of the foregoing, it is respectfully submitted that each of the rejected claims 1, 2, 4, 9, 15, 16, and 19 includes features that have not been disclosed or even suggested in Freige. Reconsideration and withdrawal of the rejections under 35 USC 102 are respectfully requested.

Claim Rejections - 35 USC 103

Claims 3 and 10 were rejected under 35 USC 103(a) as allegedly being unpatentable over Freige in view of United States Patent No. 3,909,702 (hereinafter "Hart"). It is alleged on page 4 of the Office Action that Hart teaches regulation circuitry wherein power sources are responsive to an average of sensed power supply voltages. The Applicants acknowledge that Hart refers to sensing the average voltage of load 105 and varying circuit switching. However, even if one were to combine such teachings of Hart with those of Freige, which the Applicants in no way concede would be obvious, the combined teachings would not render the subject matter of claims 3 and 10 unpatentable.

On page 4 of the Office Action, it is suggested that it would be obvious "to modify Freige to sense the average current in order to provide a stable output power to the loads average power requirements". This statement is not entirely understood, since Hart does not refer to current sensing, and the rejected claims 3 and 10 also do not recite current sensing. Hart clearly refers to sensing the average voltage of a load. Claims 3 and 10 recite sensed power supply voltage. It is therefore not clear how Hart would render current sensing obvious or why this would at all be relevant to the rejected claims.

Supposing, solely for the sake of argument, that one were to combine the average load voltage sensing in Hart into the power modules disclosed in Freige, this also would not render the claimed subject matter obvious. In such a combined system, each power module might sense its own average voltage, and use that sensed average voltage in its own voltage regulation. Thus, the per-module regulation mechanism in Freige discussed in detail above could arguably be modified to use a sensed average voltage in each module.

Turning now to claim 3, however, this claim clearly recites that each of the power sources is responsive to an average of the sensed power supply voltages. According to claim 2, from which claim 3 depends, a plurality of voltage sensors sense power supply voltages at a plurality of points in the power distribution network. Claim 10 similarly recites that the voltage of the supplied power is sensed at a plurality of points in the power distribution network, and that the currents supplied by the plurality of power sources are regulated in dependence upon an average of the sensed voltages.

Thus, claims 3 and 10 explicitly recite a form of “spatial” average over multiple sensing points, such that multiple power sources are regulated on the basis of an average supply voltage over those points. The average voltage that might be used in a combined system based on Freige and Hart would be a time average, wherein a different average voltage is used in each power module, and not a spatial average that is used by all power modules in accordance with the claims.

It is respectfully submitted that the claimed average of sensed voltage patentably distinguishes claims 3 and 10 over the combined teachings of Freige and Hart.

Claims 6, 7, 13, and 14 stand rejected as allegedly being unpatentable over Freige in view of United States Patent No. 6,317,345 (hereinafter “Hayward”). The Office Action suggests that it would be obvious to modify Freige for implementation on a circuit card.

The Applicants first wish to note that such a modification would actually be contrary to the teachings of Freige. As described at lines 52 to 57 of Column 1 of Freige, for example, one goal of the invention is to provide power in such a way as to reduce the physical size of the system and the amount of heat produced by a system. Accordingly, a system user's work space is unencumbered with bulky, heat producing equipment. Column 3, lines 14 to 19 similarly refer to locating the power module remotely from a computer system, and putting the power module on the floor away from the user's work space. Clearly, the modular power supply system in Freige, and specifically the power modules thereof, are not intended for implementation on a circuit card.

Even if one were to combine the teachings of Hayward with those of Freige, which the Applicants submit would not be obvious, the subject matter of the rejected claims is patentable over any such combination. The combined teachings would lack at least the distinguishing features discussed in detail above in the context of the independent claims. For example, a combined system would not render obvious at least the claimed features relating to multiple power supplies responsive to the same sensed power supply voltage and regulating current or power based on that sensed voltage.

It is therefore believed to be clear that claims 6, 7, 13, and 14 are patentable over Freige and Hayward.

Regarding claim 5, this claim was rejected under 35 USC 103(a) as allegedly being unpatentable over Freige in view of United States Patent No. 5,952,733 (hereinafter "Johnston").

The Applicants also question the rationale for combining the teachings of Freige and Johnston. On page 5 of the Office Action, it is suggested that it would have been obvious to modify Freige to output different currents with different weights in order to increase the efficiency of the secondary convertors, based on the different voltages illustrated, for example, in Figure 5 of Johnston. How this would possibly increase the efficiency of the secondary convertors disclosed in Freige is not clear. Also, since Freige already discloses DC-to-DC convertors which are operable to change the first DC voltage produced by the power modules to

a second regulated DC voltage selected from a plurality of programmed voltage values, it would appear as though such different voltages are provided by Freige itself. No modification would therefore appear to be required to enable Freige to provide different voltage levels.

It is also unclear how the disclosure of different voltage levels in Johnston would render obvious any modifications to Freige to output different currents with different weights. Thus, even if one were to somehow attempt to apply the teachings of multiple voltage levels in Johnston to the modular power supply system in Freige, any combined system would not provide for regulated currents with different relative weights, as recited in claim 5. Neither of the cited references teaches regulation of power source output currents, and accordingly current regulation would also necessarily be absent from any combination of the teachings of the two references.

It is thus respectfully submitted that claim 5 is patentable over Freige and Johnston.

Finally, claim 11 stands rejected at allegedly being unpatentable over Freige in view of Hart and further in view of Johnston. Supposing the teachings of Johnston were to be combined with the combined teachings of Freige and Hart, which the Applicants strongly contest on the basis that such a combination would not be obvious, the subject matter of claim 11 would not be rendered unpatentable.

In the paragraph bridging pages 5 and 6 of the Office Action, an analysis of claim 11 which is substantially the same as the analysis of claim 5 is presented. The difference between the analyses of claims 5 and 11 is that Johnston is relied upon in combination with Freige and Hart instead of Freige alone. This different basis for the rejection of claim 11 arises from the fact that claim 11 depends from claim 10, which as discussed in detail above includes a spatial average sensed voltage feature. At least this feature, in addition to current regulation as recited in claim 9, from which claim 11 ultimately depends, would not be obvious from the combined teachings of the three cited references. The Applicants also note the further issues discussed in detail above with respect to combining Johnston with Freige in the first place.

Claim 11 therefore is patentable over the combination of Freige, Hart, and Johnston for at least these reasons.

It is thus respectfully submitted that all of the rejected claims are patentable over the cited references. Reconsideration and withdrawal of the rejections under 35 USC 103 are respectfully requested.

The Applicants believe that the present application is in allowable form, and timely issuance of a Notice of Allowance is respectfully requested.

In the event that any issues remain to be resolved prior to allowance of the application, the Examiner is invited to contact the undersigned by telephone so as to most expediently resolve such issues.

Respectfully submitted,

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